**Program 408b (Python)**

**(Comparing Search Methods)**

**Program Description:** Create a program that reads a list of 100 unique integers and allows the user to search for a specific number using both linear and binary search methods. Implement these search functions in separate modules. The program should display whether the number is found or not for each search method and benchmark the time taken by each. Allow the user to search for 3 different numbers; return -1 if the number is not found and print “Number not found” to the console.

**Modules and Classes:**

1. SearchAlgorithms: Contains a function linear\_search(list, target) that iterates through the list to find the target, and a function binary\_search(list, target) that uses binary search algorithm to find the target. Ensure the list is sorted before using binary search.
   * For binary search, you may use Python's built-in sort() method to sort the list before performing the search. Remember to demonstrate the difference in performance between linear and binary search by comparing their benchmark times. Do not include the time it takes to run the sort function in the benchmark.
2. Main Program: Reads the list of integers and the target number from the user. Calls both search functions from the respective modules and benchmarks the time taken.
   * Call linear search twice – once where the list is unsorted, and a second time after sorting the list (which you’ll also use for binary search).

**Benchmarking:** Use Python's time module to measure the time taken by each search function. Record the time before and after each function call and calculate the duration.

**Additional Requirements:**

* Use time.perf\_counter() for benchmarking. (e.g., start = time.perf\_counter())
* Report the search duration to the 8th decimal place. (f”{end\_time-start\_time:.8f}”)
* Ensure proper handling of cases where the number is not found.
* Provide clear output formatting for readability.

**Data Location:** prog408b.dat, user input

**Sample Output:**

Enter the number to search: 50

Linear Search (Unsorted): Number found at index 77

Search time: 0.00001570 seconds

Linear Search (Sorted): Number found at index 16

Search time: 0.00000420 seconds

Binary Search: Number found at index 16

Search time: 0.000004 seconds

Enter the number to search: 12

Linear Search (Unsorted): Number not found

Search time: 0.00001410 seconds

Linear Search (Sorted): Number not found

Search time: 0.00000500 seconds

Binary Search: Number not found

Search time: 0.000004 seconds

Enter the number to search: 31

Linear Search (Unsorted): Number found at index 17

Search time: 0.00000820 seconds

Linear Search (Sorted): Number found at index 5

Search time: 0.00000330 seconds

Binary Search: Number found at index 5

Search time: 0.000003 seconds